Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

the expansion of $(\frac{1}{2}+\frac{1}{2})^{50}$. Then the distribution is well described by a Gaussian function in which

$$\sigma=\sqrt{(50\times\tfrac{1}{2}\times\tfrac{1}{2})}=\frac{5\sqrt{2}}{2}.$$

In this case,

$$E_2=3.99,$$
$$E_3=5.97,$$
$$E_{10}=10.92.$$

The results (3) give a precise notion as to the values of the mean difference between extreme individuals of a small sample taken at random from a totality that is distributed in accord with Gauss's law.

Since many frequency distributions not well described by Gauss's law are well described by its generalizations, it seems likely that results, such as concern us here, when derived from Gauss's curve apply at least roughly to many more general types of frequency distributions that occur in statistics. To illustrate, the distribution of examination marks given on p. 237 is not at all well fitted by numbers proportional to the terms in the expansion of $(\frac{1}{2}+\frac{1}{2})^{50}$; but, if we use the ungraduated values there given to evaluate (1) by quadrature, we obtain, for the mean difference in taking sets of two, the value 7.71. But, if we compute $\sigma$ as the square root of the mean square of the deviations of observations from their mean value, the result is 7.42. Then, from (3), $E_2=8.38$ to compare with 7.71; and, hence, the result from the assumption of the law of Gauss gives at least a good general notion of the mean difference in question.

◆

# DEPARTMENTS.

## SOLUTIONS OF PROBLEMS.

### ALGEBRA.

**342. Proposed by E. B. ESCOTT, Ann Arbor, Michigan.**

Prove that $\frac{1}{1.2.3.4}+\frac{1}{5.6.7.8}+\ldots=\frac{1}{4}\log 2-\frac{1}{24}\pi$. [Hobson's *Plane Trigonometry*, page 348.]

**Solution by V. M. SPUNAR, Cleveland, Ohio, and the PROPOSER.**

The general term is

$$\frac{1}{(4n-3)(4n-2)(4n-1)4n}=\tfrac{1}{6}\left(\frac{1}{4n-3}-\frac{3}{4n-2}+\frac{3}{4n-1}-\frac{1}{4n}\right)$$

$$=\tfrac{1}{6}\left(\frac{2}{4n-3}-\frac{2}{4n-2}+\frac{2}{4n-1}-\frac{2}{4n}\right)-\tfrac{1}{6}\left(\frac{1}{4n-3}-\frac{1}{4n-1}\right)-\tfrac{1}{6}\left(\frac{1}{4n-2}-\frac{1}{4n}\right).$$

Therefore the series may be written

$$\tfrac{1}{3}(1-\tfrac{1}{2}+\tfrac{1}{3}-\tfrac{1}{4}+\ldots)-\tfrac{1}{6}(1-\tfrac{1}{3}+\tfrac{1}{5}-\tfrac{1}{7}+\ldots)-\tfrac{1}{12}(1-\tfrac{1}{2}+\tfrac{1}{3}-\tfrac{1}{4}+\ldots)$$

$$=\tfrac{1}{4}\log 2-\tfrac{1}{6}\tan^{-1}1=\tfrac{1}{4}\log 2-\tfrac{1}{24}\pi.$$

**343. Proposed by THEODORE L. DeLAND, Treasury Department, Washington, D. C.**

A, on contracting to execute a piece of work for \$300 and finding after working alone one day that he had finished but 1% of the entire work, engaged B to assist him at the beginning of the second day, with the understanding, that B on each day was to do 6% as much work as had been completed previously, while A each day was to do an amount of work equal to 1% of the unfinished work at the close of the day before. At the completion of all the work the \$300 were divided between A and B in proportion to the amount of the work each had performed.

Required—(1) The number of days to do the work; (2) on which day would the daily earnings of A and B be the same; and (3) the amount of money each was paid under the agreement.

**Solution by the PROPOSER.**

Let $r=1\%$ and $r_1=6\%$; and let $x$, a variable, $=$the time in days to do the whole work, or 1; and let the whole work completed to the end of the days 0, 1, 2, 3, ..., $x$, $x+1$, ..., be represented by the functions $u_0$, $u_1$, $u_2$, ..., $u_x$, $u_{x+1}$, ... The whole work completed to the end of the day $x+1$, or $u_{x+1}$, is equal to the work completed to the end of $x$ days, or $u_x$, plus the part completed by A on the day $x$, or $r(1-u_x)$, plus the part completed by B on the day $x$, or $r_1u_x$. Equate the functions and have:

$$u_{x+1}=u_x+r(1-u_x)+r_1u_x\ldots(1);$$

$$\text{or, } u_{x+1}-(1-r+r_1)u_x=r\ldots(2).$$

Give the equation numerical values and we have

$$u_{x+1}-(1.05)u_x=0.01\ldots(3).$$